GRADE 12 DIPLOMA EXAMINATION

Biology 30

June 1991

Alberta
EDUCATION

GRADE 12 DIPLOMA EXAMINATION
BIOLOGY 30

DESCRIPTION

Time: 2½ hours

Total possible marks: 100

This is a **closed-book** examination consisting of **two** parts:

PART A has 70 multiple-choice questions each with a value of one mark.

PART B has seven written-response questions for a total of 30 marks.

NOTE: The perforated pages at the back of this booklet may be torn out and used for your rough work. **No marks** will be given for work done on the tear-out pages.

GENERAL INSTRUCTIONS

Fill in the information required on the answer sheet and the examination booklet as directed by the examiner.

Carefully read the instructions for each part before proceeding.

DO NOT FOLD EITHER THE ANSWER SHEET OR THE EXAMINATION BOOKLET.

The presiding examiner will collect your answer sheet and examination booklet and send them to Alberta Education.

JUNE 1991

PART A

INSTRUCTIONS

In this part of the examination, there are 70 multiple-choice questions each with a value of one mark.

Read each question carefully and decide which of the choices **best** completes the statement or answers the question. Locate that question number on the separate answer sheet provided and fill in the space that corresponds to your choice. **Use an HB pencil only**.

Example

This diploma examination is for the subject of

A. Biology
B. Physics
C. Chemistry
D. Mathematics

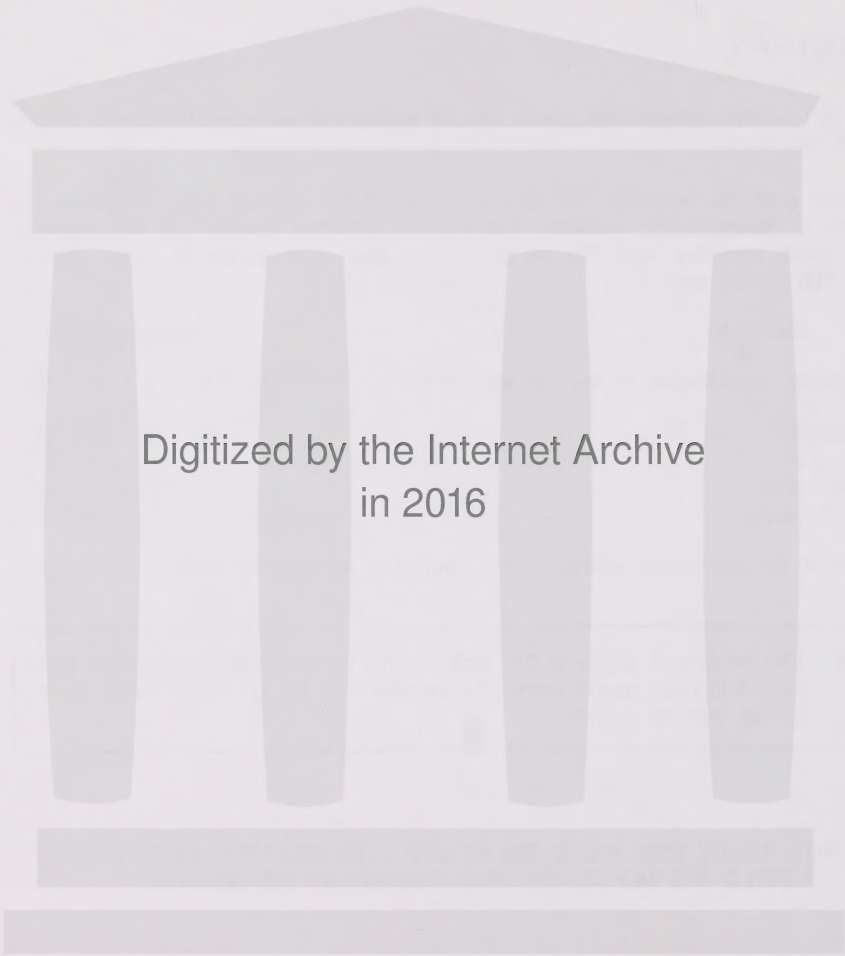
Answer Sheet

A	B	C	D
●	②	③	④

If you wish to change an answer, erase your first mark completely.

NOTE: The perforated pages at the back of this booklet may be torn out and used for your rough work. **No marks** will be given for work done on the tear-out pages.

DO NOT TURN THE PAGE TO START THE EXAMINATION UNTIL TOLD TO DO SO BY THE PRESIDING EXAMINER.



1. Which cell component is found in the nucleoplasm?

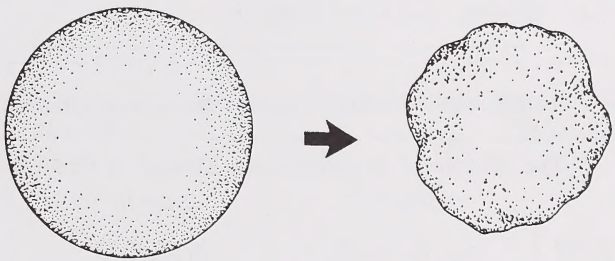
   A. Lysosome
   B. Chromatin
   C. Mitochondrion
   D. Endoplasmic reticulum

2. Synaptic vesicles, found at the ends of an axon, release their contents into the synaptic cleft by

   A. exocytosis
   B. endocytosis
   C. pinocytosis
   D. phagocytosis

Use the following information to answer question 3.

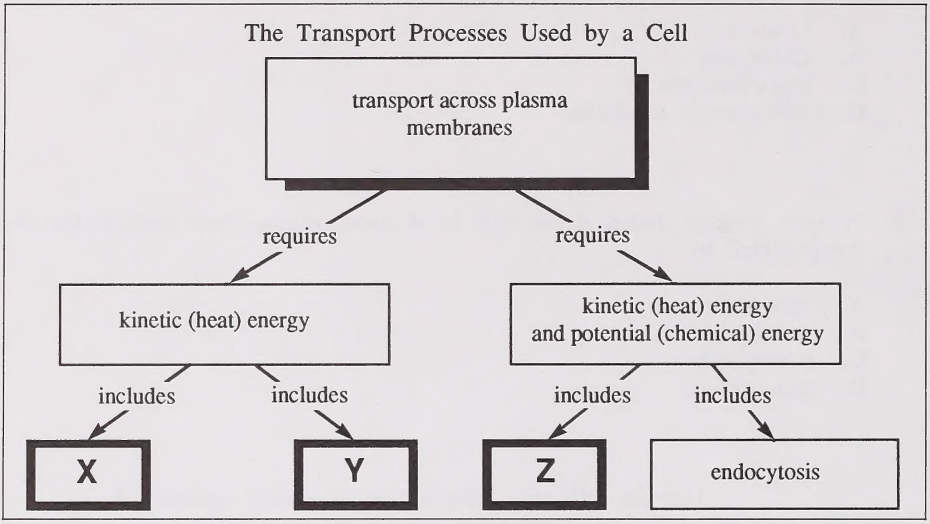
Using a microscope, a student observed a red blood cell in solution and made the following diagram to indicate the changes that occurred in the cell over a period of 2 min.



3. It would be reasonable for the student to conclude that the

   A. cell gained water by osmosis
   B. cell took in too many ions by active transport
   C. change in cell shape was caused by oxygen loss
   D. solution contained a higher concentration of solutes than did the cell

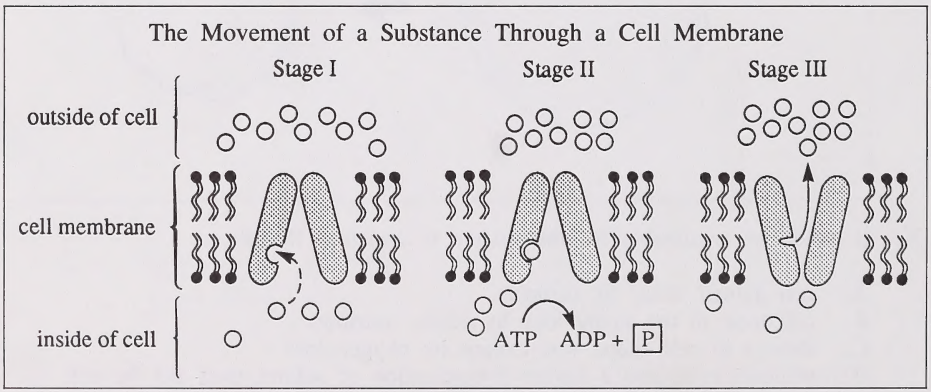
Use the following concept map to answer question 4.



4. The processes labelled X, Y, and Z are, respectively,

   A. diffusion, exocytosis, and active transport
   B. osmosis, active transport, and exocytosis
   C. diffusion, active transport, and osmosis
   D. osmosis, diffusion, and active transport

Use the following diagram to answer question 5.



5. The cell process illustrated most likely represents movement of

   A. oxygen from an alveolus into the blood
   B. sodium ions from a neuron into the ECF
   C. urea from the glomerulus into a Bowman's capsule
   D. water from a villus of the small intestine into the blood

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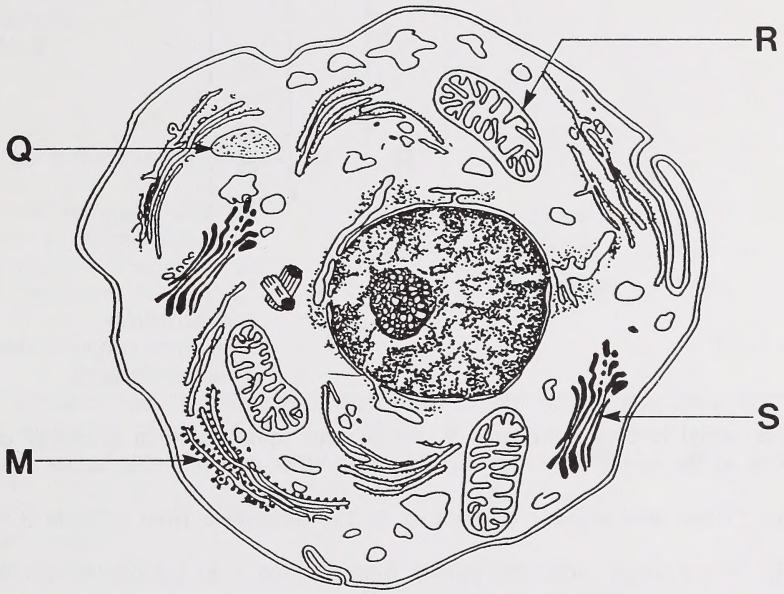
Use the following diagram to answer question 6.

A Generalized Human Cell Showing Organelles

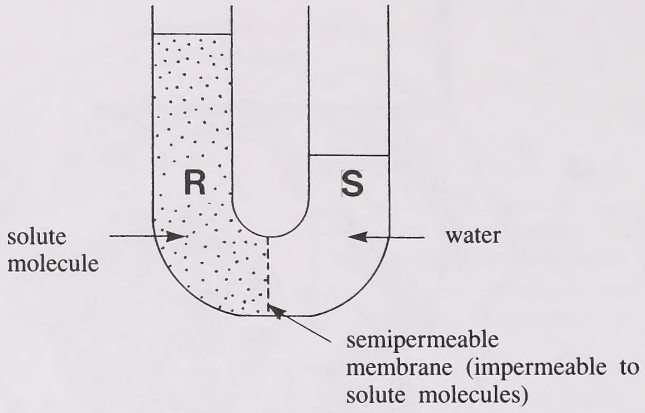


6. Which labelled organelle causes an increase in the carbon dioxide concentration in the cytoplasm of the cell?

A. M
B. Q
C. R
D. S

Use the following diagram to answer question 7.

The Movement of Molecules Through a Semipermeable Membrane



7. The initial levels of solutions R and S were equal and then gradually changed over time to the levels shown in the diagram. What is a probable cause of this change?

A. Water was actively transported by the membrane from solution S to solution R.

B. More solute molecules moved from solution S to solution R, resulting in an increase in the level of solution R.

C. The solute concentration of solution S was greater than that of solution R, resulting in an unequal movement of water.

D. The solute concentration of solution R was greater than that of solution S, resulting in an unequal movement of water.

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8. If body temperature decreases from 37°C to 32°C, enzyme activity will most likely

A. remain the same
B. increase
C. decrease
D. cease

9. Which chemical substances are most easily digested and then used as an energy source in the human body?

A. Lipids
B. Proteins
C. Vitamins
D. Carbohydrates

10. People who are strict vegetarians should select their food carefully in order to prevent a deficiency in which group of substances?

A. Essential amino acids
B. Complex carbohydrates
C. Vitamins
D. Minerals

11. Lipids are formed by the bonding of

A. amino acids and glycerol
B. fatty acids and glycerol
C. glycogen and amino acids
D. glycogen and fatty acids

12. Which substance turns a blue-black color when treated with a few drops of iodine solution?

A. Table salt
B. White bread
C. Table sugar
D. Powdered milk

Use the following information to answer question 13.

Characteristics of Mucus in the Digestive Tract

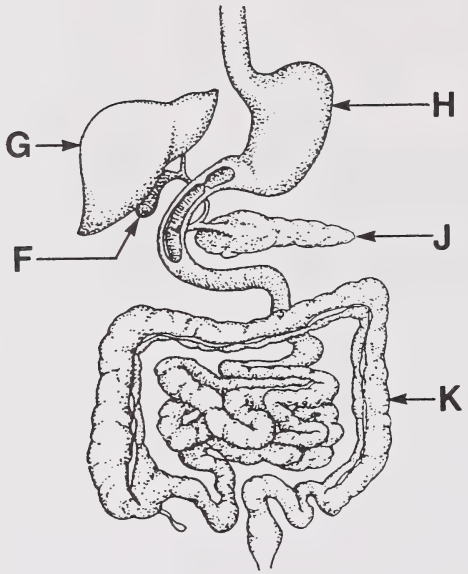
I. Sticks to food and forms a thin film over the surface of particles
II. Coats the wall of the digestive tract and prevents actual contact of food particles with the mucosal layer
III. Provides lubrication so that food particles can slide along easily
IV. Resists the action of digestive enzymes
V. Buffers small amounts of acid or base

13. Which three characteristics of mucus are the most important in preventing ulcers?

A. I, II, and III
B. I, III, and IV
C. II, III, and V
D. II, IV, and V

Use the following diagram to answer questions 14 and 15.

A Portion of the Human Digestive System



14. Enzymes used for the digestion of carbohydrates, fats, and proteins are secreted in significant amounts by the structure labelled

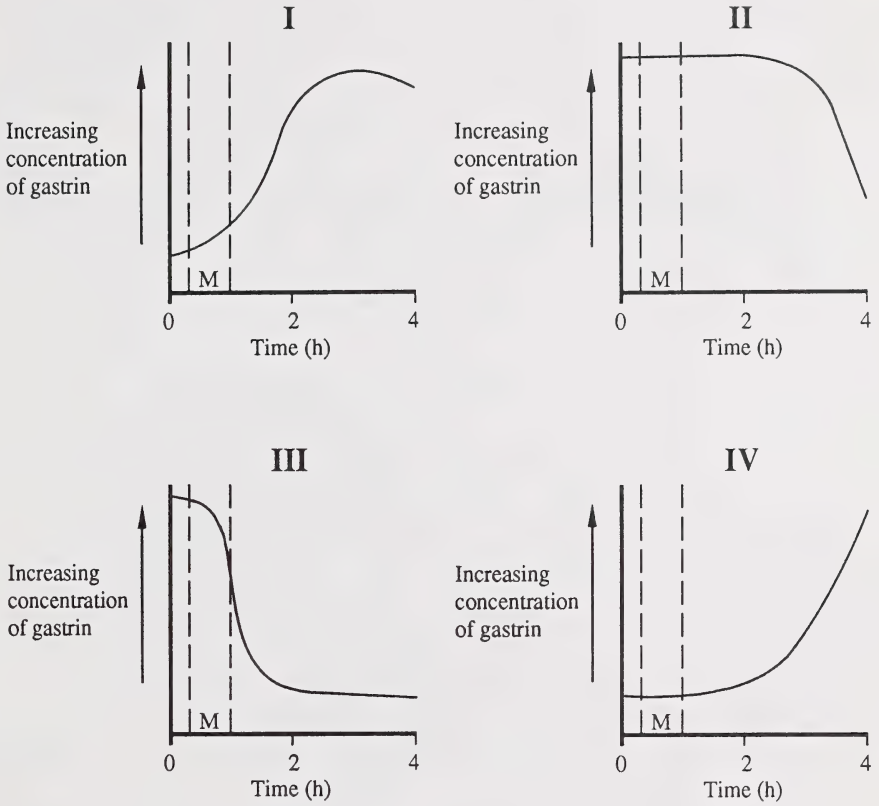
A. G
B. H
C. J
D. K

15. When the structure labelled F is removed surgically, the body function most affected is the

A. digestion of fats
B. production of urea
C. production of gastrin
D. conversion of glycogen to glucose

Use the following graphs to answer question 16.

Four Hypothetical Graphs of a Person's Blood Gastrin Concentration



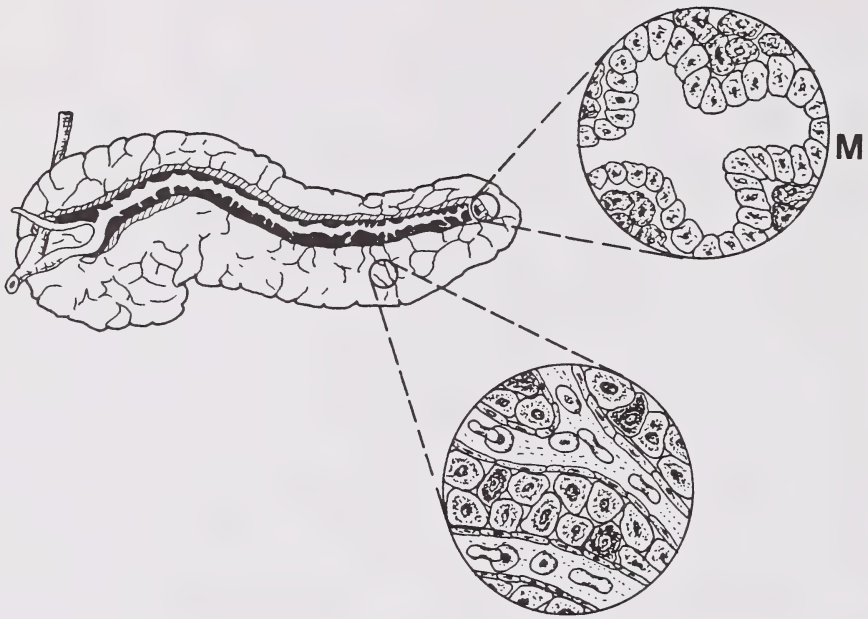
Note: The section labelled M represents the time period during which a balanced meal was eaten.

16. Which graph shows the blood gastrin concentration just before, during, and after the person eats the balanced meal?

A. I
B. II
C. III
D. IV

Use the following diagram to answer question 17.

Surface and Sectional Views of the Human Pancreas



17. Which series describes the glandular tissue labelled M?

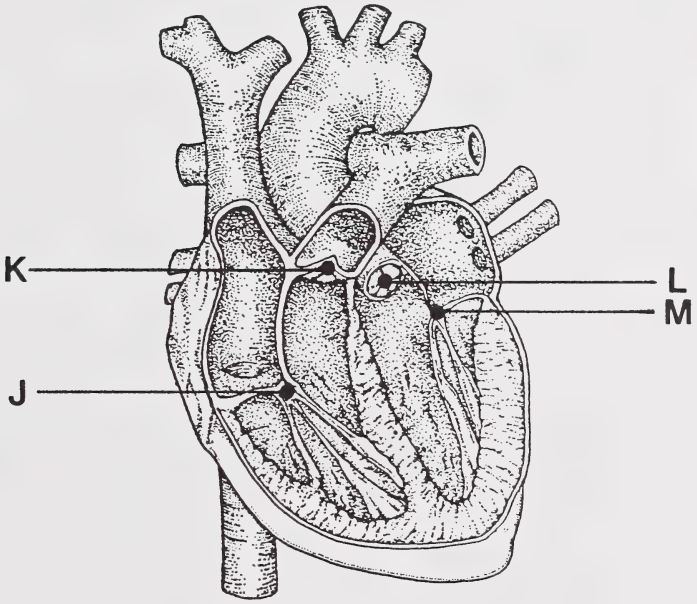
Series	Type of Glandular Tissue	Type of Secretion	Location Where Secretion Functions
A	exocrine	hormone	interior of small intestine
B	endocrine	hormone	liver
C	exocrine	enzyme	interior of small intestine
D	endocrine	enzyme	liver

18. The superior and inferior venae cavae are classified as veins because they

A. carry blood away from the heart
B. return blood to the heart
C. carry deoxygenated blood
D. carry oxygenated blood

Use the following diagram to answer question 19.

A Ventral View of a Longitudinal Section of the Human Heart



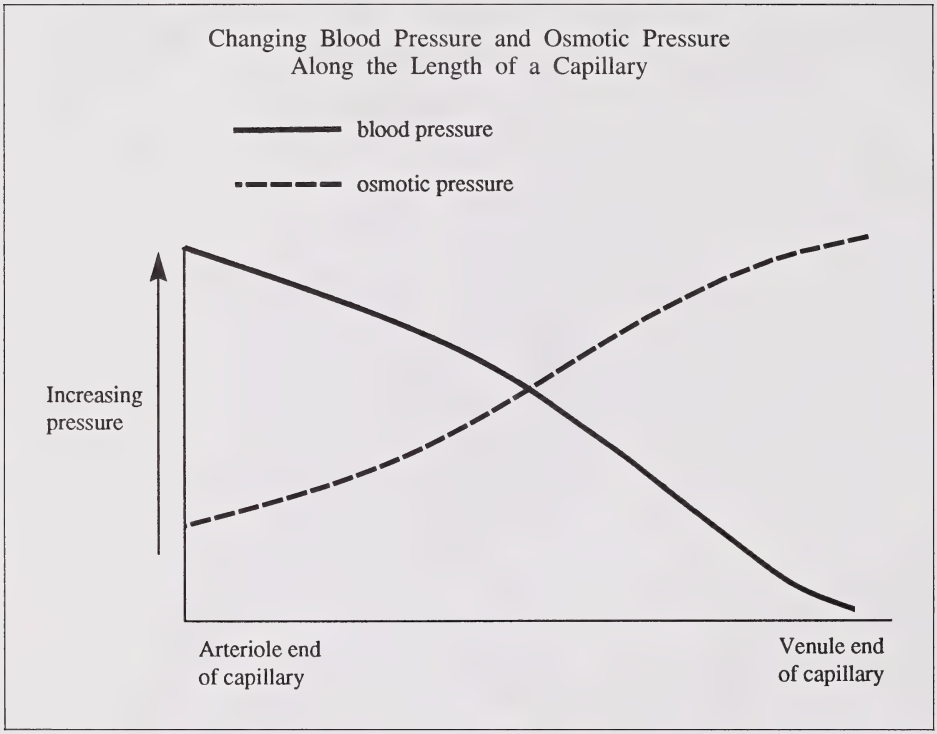
19. In a normally functioning heart, blood is prevented from flowing back into the right ventricle by the valve labelled

A. J
B. K
C. L
D. M

20. Blood enters the right atrium by way of the

A. aorta
B. venae cavae
C. pulmonary veins
D. pulmonary artery

Use the following graph to answer question 21.



21. At the arteriole end of the capillary,

A. water will flow equally into and out of the capillary because of equal blood pressure and osmotic pressure

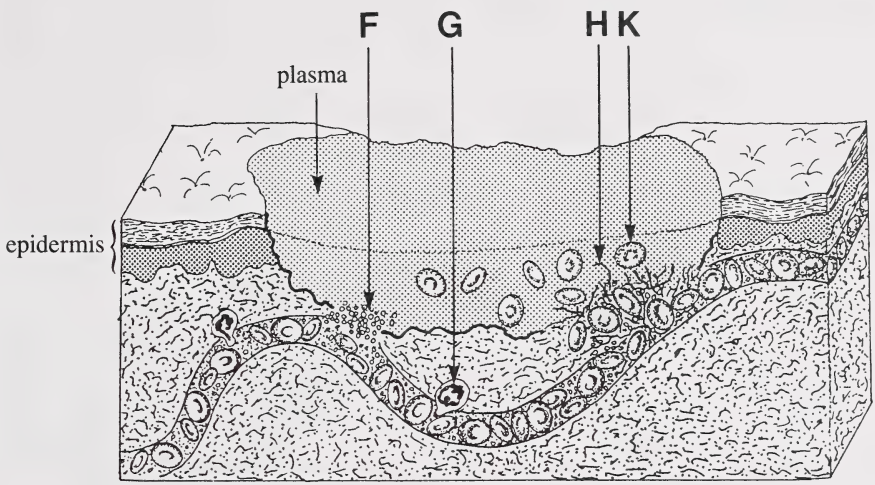
B. water will flow equally into and out of the capillary because of low blood pressure and high osmotic pressure

C. there will be a net flow of water out of the capillary because of high blood pressure and low osmotic pressure

D. there will be a net flow of water out of the capillary because of low blood pressure and high osmotic pressure

Use the following diagram to answer questions 22 and 23.

A Representation of a Damaged Skin Capillary



22. The structures labelled F, G, H, and K are, respectively,

A. an erythrocyte, fibrin, a platelet, and a leukocyte
B. a platelet, fibrin, a leukocyte, and an erythrocyte
C. a platelet, a leukocyte, fibrin, and an erythrocyte
D. an erythrocyte, a leukocyte, fibrin, and a platelet

23. Which statement describes the functional relationship between structures represented in the diagram?

A. The plasma is secreted by the damaged epidermis.
B. The cellular division of structure G produces structure K.
C. The endocytic activity of structure K will remove structure F.
D. The formation of structure H is initiated by the breakdown of structure F.

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24. Iron is essential to the body because it

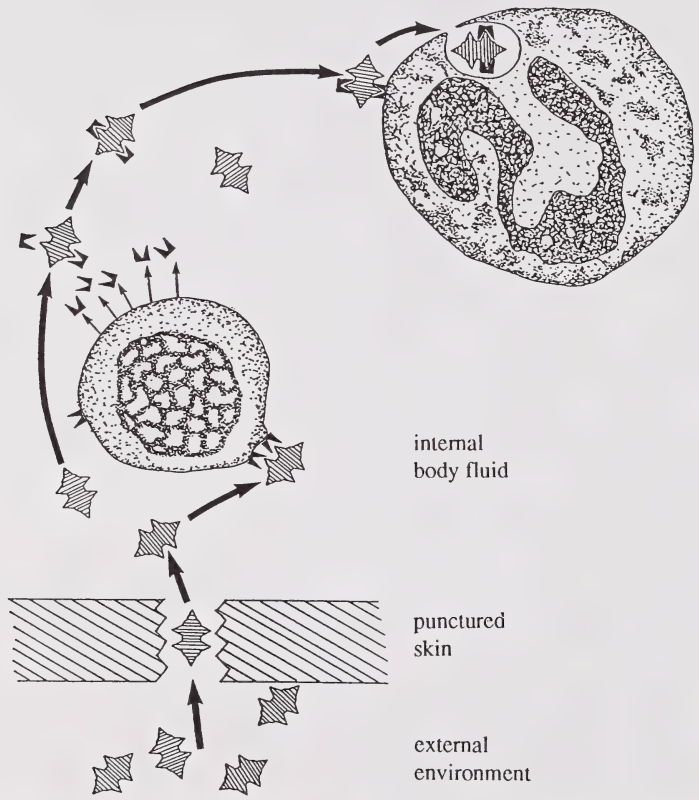
A. aids in blood clotting
B. aids in antibody formation
C. is incorporated into the hemoglobin molecule
D. is incorporated into the erythrocyte membrane

25. Human red and white blood cells are similar in that both

A. contain pigments
B. can undergo cell division
C. have nuclei throughout their life span
D. are formed in the marrow of long bones

Use the following diagram to answer question 26.

A Representation of a Human Defence Mechanism

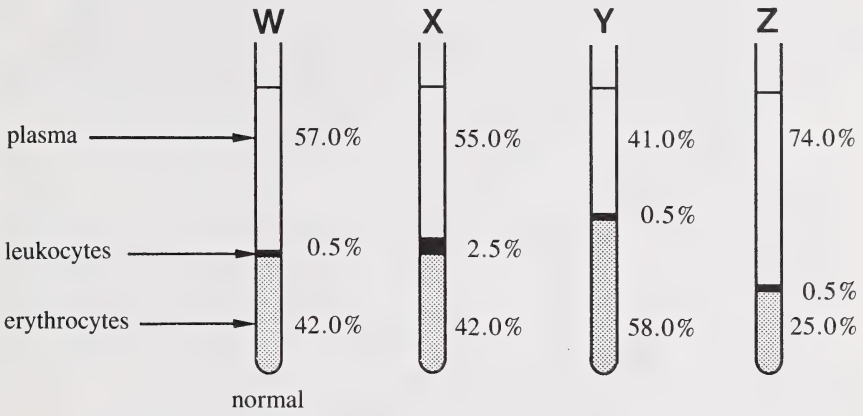


26. The sequence of steps illustrates how

A. leukocytes protect the body through antibody production and phagocytosis
B. leukocytes protect the body through exocytosis of enzymes
C. lysosomes engulf foreign substances
D. platelets initiate blood clotting

Use the following information to answer question 27.

When blood samples from subjects W, X, Y, and Z are each mixed with an anticoagulant and are centrifuged, the samples separate into plasma, leukocytes, and erythrocytes. The diagrams represent the centrifuged blood samples of the four subjects. Subject W has lived at sea level for some time, and this person's sample is considered normal.

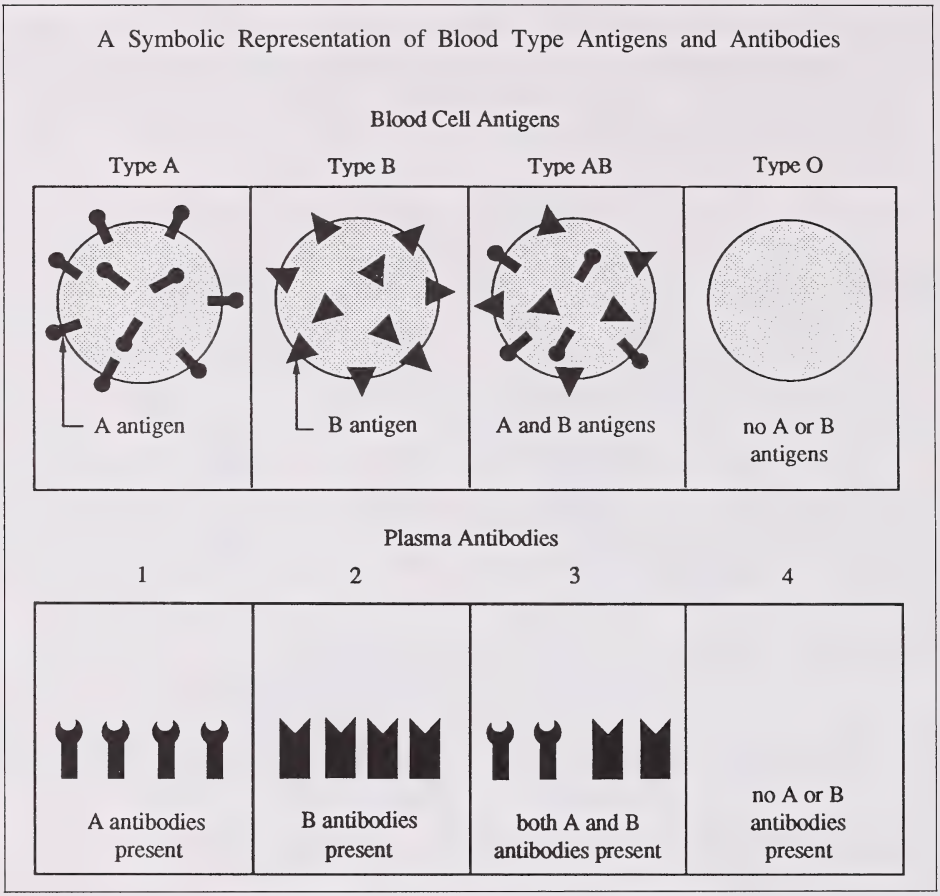


Note: Platelets have not been included in the analysis.

27. The subjects who are most likely suffering from anemia and from a bacterial infection **respectively** are

A. X and Y
B. X and Z
C. Y and X
D. Z and X

Use the following diagram to answer question 28.



28. The plasma antibody compositions that correspond to blood types A, B, AB, and O **respectively** are

A. 1, 2, 3, and 4
B. 1, 2, 4, and 3
C. 2, 1, 3, and 4
D. 2, 1, 4, and 3

29. Inhalation occurs when the diaphragm

A. contracts and moves up while the rib muscles relax, allowing the ribs to move down and out

B. relaxes and moves down while the rib muscles relax, allowing the ribs to move down and out

C. contracts and moves down while the rib muscles contract, moving the ribs up and out

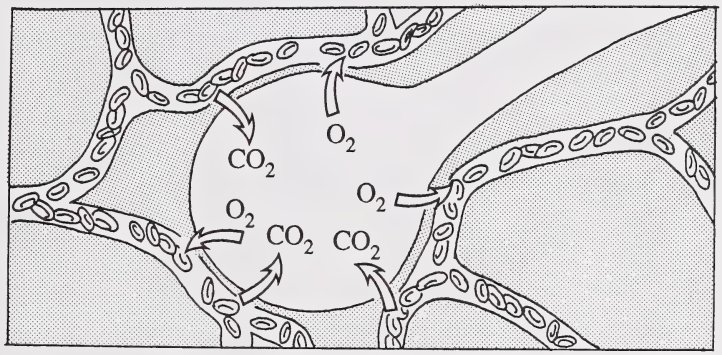
D. relaxes and moves up while the rib muscles contract, moving the ribs down and in

30. The body responds to a change from low to high altitude by increasing

A. the number of erythrocytes
B. the number of leukocytes
C. force filtration of CO_2
D. peristaltic function

Use the following diagram to answer question 31.

An Alveolus and Associated Capillaries

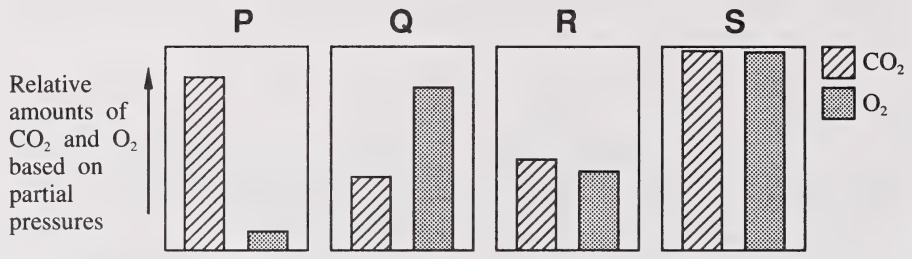


31. The diagram represents the

A. release of CO_2 and the intake of O_2 by leukocytes
B. exchange of gases between the alveolus and the capillaries
C. intake of O_2 by the blood and the release of CO_2 from leukocytes
D. intake of O_2 by erythrocytes and the release of CO_2 into the interstitial fluid

Use the following graphs to answer question 32.

Four Hypothetical Graphs Showing Relative Amounts of CO_2 and O_2 in Blood



32. Blood that has just left the heart in the systemic circulation would probably have relative amounts of CO_2 and O_2 as shown by the graph labelled

A. P
B. Q
C. R
D. S

Use the following table to answer question 33.

Subject	Hemoglobin (g/100 mL of blood)	O_2 Content of Arterial Blood (mL O_2/100 mL of blood)	O_2 Content of Venous Blood (mL O_2/100 mL of blood)	Cardiac Output (L/min)
Normal	15	19	15	5.0
W. Hypoxia	15	13	10	6.6
X. Hypoxia	12	13	10	7.0
Y. Hypoxia	16	20	13	3.0
Z. Hypoxia	15	19	18	unknown

Note: Hypoxia is a deficiency in the amount of O_2 reaching the tissues of the body.

33. Cellular respiration in one of the subjects above is blocked. Which statement below identifies that subject, with supporting evidence from the chart?

A. Subject W, because of the low O_2 content of the arterial blood
B. Subject X, because of the low hemoglobin content of the blood
C. Subject Y, because of the low O_2 content of the venous blood
D. Subject Z, because of the high O_2 content of the venous blood

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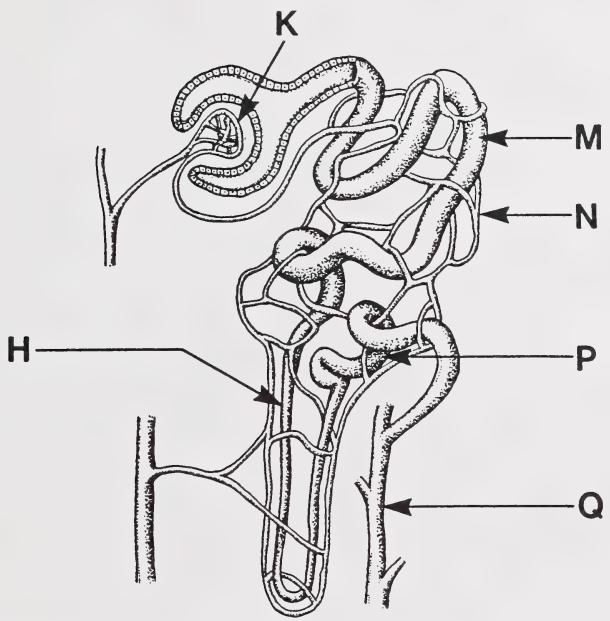
34. Electrons are transferred from weak to stronger acceptors. An example of a strong electron acceptor is

A. O_2
B. ATP
C. H_2O
D. CO_2

Use the following diagram to answer questions 35 and 36.

A Human Nephron



35. An increase in blood pressure would most directly affect the function of the structure labelled

A. H
B. K
C. M
D. P

36. The concentration of urea is greatest in the structure labelled

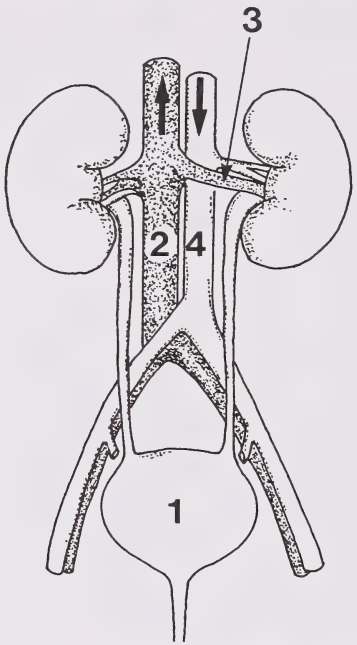
A. M
B. N
C. P
D. Q

37. Fluid is delivered to the urinary bladder by the

A. ureters
B. urethra
C. renal veins
D. collecting ducts

Use the following diagram to answer question 38.

The Human Urinary System with Associated Blood Vessels



38. The concentration of glucose is lower in the structure labelled

A. 1 than in the structure labelled 2
B. 3 than in the structure labelled 1
C. 4 than in the structure labelled 2
D. 4 than in the structure labelled 3

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39. Which function is **not** carried out by human kidneys?

A. The regulation of the pH of the blood
B. The formation of urea from excess amino acids
C. The removal of metabolic wastes from the blood
D. The regulation of the amount of water in the blood

Use the following table to answer question 40.

Dialyzing Fluid from an Artificial Kidney Compared with Uremic Plasma and Normal Plasma

Constituent	Dialyzing Fluid	Uremic Plasma	Normal Plasma
Electrolytes (units/L)			
Na^+	142	142	142
K^+	4	7	5
Ca^{2+}	3	2	3
Cl^-	107	107	107
HCO_3^-	27	14	27
HPO_4^{2-}	0	9	3
Nonelectrolytes (mg/dL)			
Glucose	125	100	100
Urea	0	200	26

Note: Assume that the dialysis membrane of the artificial kidney is permeable to all the plasma constituents listed in the table.

Uremic plasma refers to the plasma of a person suffering from kidney failure.

40. Which three substances will undergo a net movement into dialyzing fluid from uremic plasma?

A. Ca^{2+}, Na^+, and Cl^-

B. Ca^{2+}, HCO_3^-, and glucose

C. K^+, HPO_4^{2-}, and urea

D. Na^+, glucose, and urea

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41. Specialized cells in the hypothalamus called osmoreceptors monitor the concentration of water in the blood and control the release of ADH. The event **most likely** to cause osmoreceptors to initiate the release of ADH is

A. depletion of blood glucose
B. dehydration of the tissues
C. storage of urine in the bladder
D. accumulation of water in the tissues

Use the following table to answer question 42.

Aldosterone Secretion	Plasma Electrolytes (mEq/L)			
	Na^+	K^+	Cl^-	HCO_3^-
Normal	142	4.5	105	25
Below normal	120	6.7	85	25
Above normal	148	2.4	96	41

42. Aldosterone affects kidney function and therefore affects plasma composition. It is evident from the table that above-normal secretion of aldosterone causes an increase in the

A. excretion of Cl^- and HCO_3^-
B. reabsorption of K^+ and the excretion of Na^+
C. reabsorption of Na^+ and the excretion of K^+
D. excretion of Na^+ and the reabsorption of Cl^-

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43. A molecule of urea passes through which sequence of structures in the excretory system?

A. Glomerulus, Bowman's capsule, loop of Henle, collecting duct, ureter, bladder, urethra

B. Bowman's capsule, glomerulus, loop of Henle, collecting duct, ureter, bladder, urethra

C. Bowman's capsule, glomerulus, loop of Henle, ureter, collecting duct, bladder, urethra

D. Glomerulus, Bowman's capsule, loop of Henle, collecting duct, urethra, bladder, ureter

Use the following information to answer question 44.

Acute Glomerulonephritis

In acute glomerulonephritis, many of the glomeruli of the kidneys become blocked by inflammation. Other glomeruli become permeable to erythrocytes and large molecules.

Characteristics and Test Results of Urine Samples from Two Individuals

Urine Sample	Color of Urine	Biuret Test	Test for Iron	Test for Urea
From a healthy individual	yellow	negative	negative	positive
From a person suffering from acute glomerulonephritis	W	X	Y	Z

44. Which words for W, X, Y, and Z describe the test results for a person suffering from acute glomerulonephritis?

A. W-red, X-negative, Y-positive, and Z-negative
B. W-red, X-positive, Y-positive, and Z-positive
C. W-yellow, X-negative, Y-negative, and Z-positive
D. W-yellow, X-positive, Y-negative, and Z-negative

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45. The part of the brain that controls pituitary secretion is the

A. cerebellum
B. hypothalamus
C. cerebral cortex
D. medulla oblongata

46. Which function of the ear would be impaired if the auditory nerve was damaged?

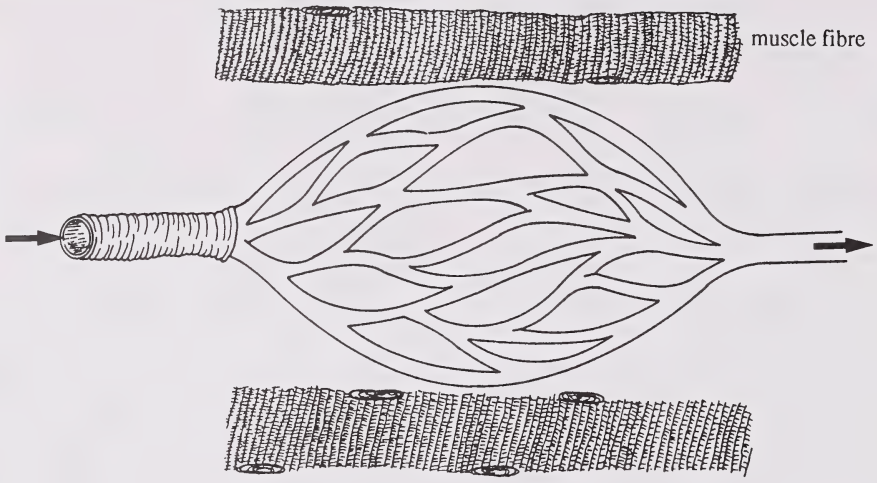
A. Conducting nerve impulses to the brain
B. Converting stimuli to nerve impulses
C. Detecting changes in body position
D. Receiving stimuli

47. Which part of the ear has the greatest influence upon body balance?

A. Cochlea
B. Ossicles
C. Eustachian tube
D. Semicircular canals

Use the following diagram to answer question 48.

Blood Flow in a Capillary Bed of a Skeletal Muscle



48. When adrenaline is released into the circulatory system,

A. glucose is converted to glycogen in the muscle cells
B. the venule dilates, allowing more blood into the capillaries
C. the arteriole dilates, allowing more blood into the capillaries
D. the arteriole constricts, limiting blood flow into the capillaries

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Use the following information to answer question 49.

A patient who continually felt tired consulted a doctor. The doctor suspected that the patient was suffering from sugar diabetes and ordered a number of laboratory tests.

49. Which test result would indicate that the patient did **not** have sugar diabetes?

A. A low metabolic rate
B. A normal amount of urine
C. A high red blood cell count
D. A normal white blood cell count

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50. An example of negative feedback is the process by which

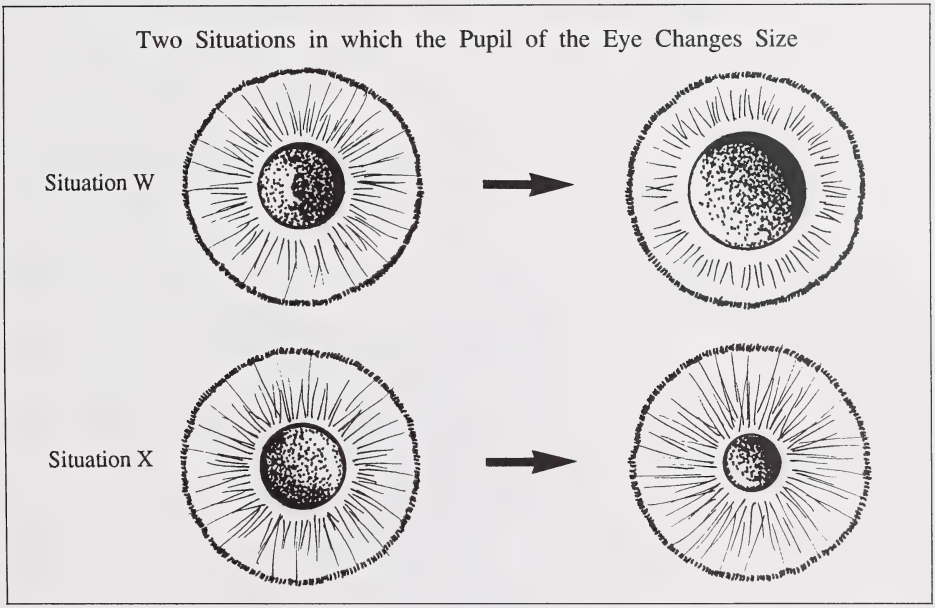
A. nerves stimulate glands to produce hormones

B. the production of hormones is regulated by the central nervous system

C. unnecessary hormones are absorbed back into the glands that produced them

D. the accumulation of a hormone in the blood inhibits further production of that hormone

Use the following diagram to answer question 51.



51. The changes in pupil size most likely happened in situation W when a person moved into a

A. room with brighter light, and in situation X when a person's sympathetic nervous system was activated

B. room with brighter light, and in situation X when a person's parasympathetic nervous system was activated

C. darker room, and in situation X when a person's sympathetic nervous system was activated

D. darker room, and in situation X when a person's parasympathetic nervous system was activated

Use the following information to answer question 52.

Events in Sound Reception

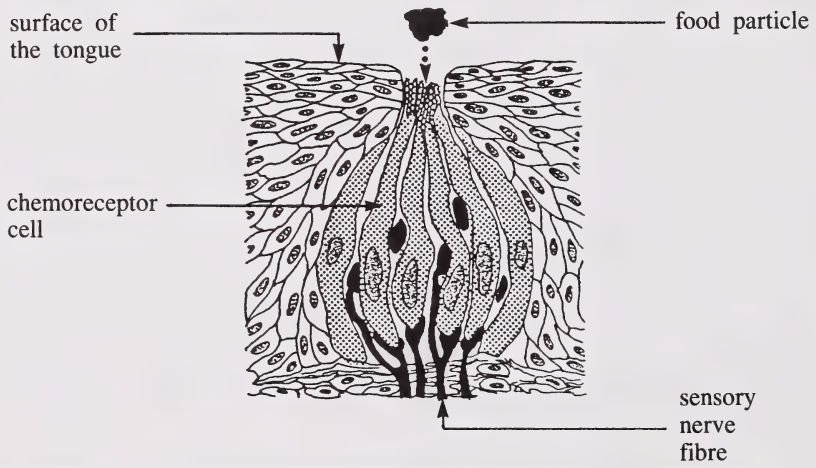
I. Cochlear fluid vibrates
II. Tympanic membrane vibrates
III. Organ of Corti forms nerve impulses
IV. Ossicles vibrate

52. The sequence in which events occur during sound reception in the ear is

A. I, II, IV, III
B. I, III, II, IV
C. II, IV, I, III
D. IV, I, II, III

Use the following diagram to answer question 53.

A Section of a Tongue Showing Chemoreceptor Cells



53. The chemoreceptor cell translates the

A. chemical properties of food particles into changes in neuron membrane permeability

B. touch of food particles into muscle contractions within the tongue

C. heat energy of food particles into sensations of hot and cold

D. pressure of food particles on the tongue into nerve impulses

---

54. The myelin sheath is a membrane that surrounds the

A. axon of a neuron
B. dendrite of a nerve
C. cell body of a neuron
D. cerebral hemispheres of the brain

55. The discovery that not all neurons release the same transmitter substance at a synapse accounts for which observation?

A. A synapse slows the transmission of the nerve impulse.

B. Successive transmissions across a synapse eventually weaken.

C. Transmission across a synapse is always one way: from the end of an axon to a dendrite.

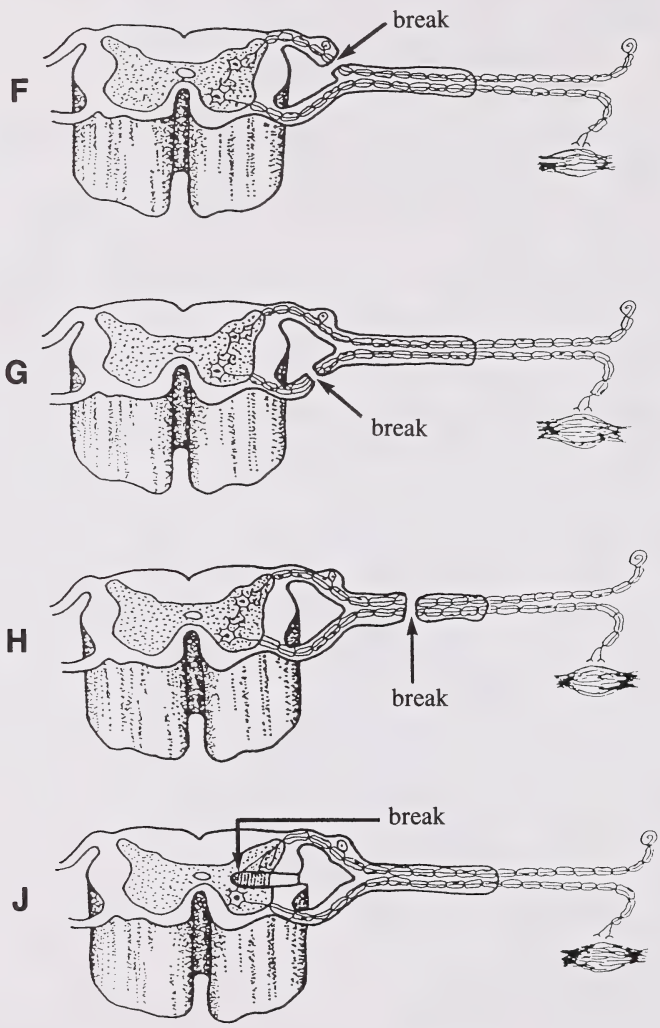
D. Stimulation of some neurons inhibits impulse transmission in those neurons that lead away from the synapse.

56. When the cerebellum is damaged, a physiological effect is the loss of

A. memory
B. hearing
C. emotions
D. muscular co-ordination

Use the following diagram to answer question 57.

Neural Pathways with Injuries at Four Different Locations



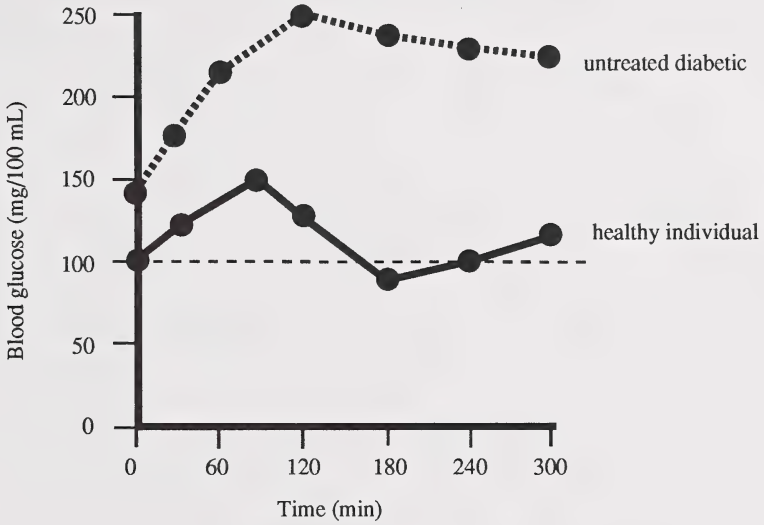
57. Which injury produces a loss of voluntary control of the motor muscles in the arm but no loss of sensation?

A. F
B. G
C. H
D. J

Use the following information to answer question 58.

Blood Sugar Regulation

At the beginning of an experiment, two individuals each swallowed 50 g of glucose in 200 mL of water. Their blood glucose levels were then tested at regular intervals.



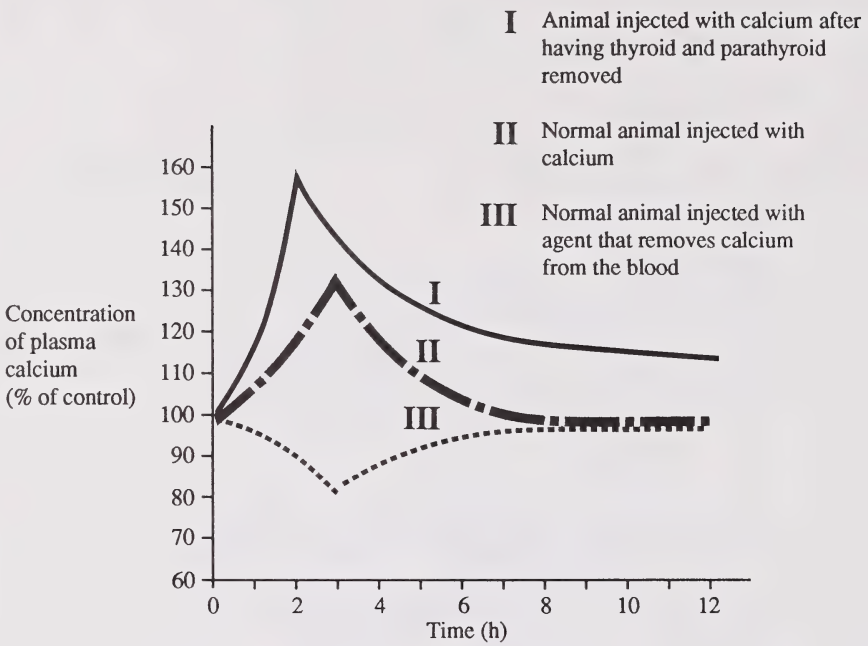
Note: Homeostatic blood sugar level in healthy humans is about 100 mg/100 mL of blood.

58. The slight drop in blood sugar level in the diabetic individual after 120 minutes was due to

A. decreased insulin production
B. conversion of glycogen to glucose
C. loss of glucose by way of the urine
D. increased conversion of fats to glucose

Use the following information to answer questions 59 and 60.

Plasma Concentration of Calcium Ions in Experimental Animals



Note: The injections were given at time = 0 h. The thyroid gland secretes a hormone that stimulates calcium absorption by bone. The parathyroid gland secretes a hormone that stimulates bone to release calcium into the blood and increases the reabsorption of calcium by nephric tubules.

59. The results obtained from the animal labelled I indicate that calcium was

A. used in the synthesis of blood-clotting constituents
B. used as an energy source in muscle contraction
C. absorbed by plasma proteins
D. excreted by the kidneys

Continued

60. Which hypothesis explains the return to normal of blood calcium levels in the animal labelled III?

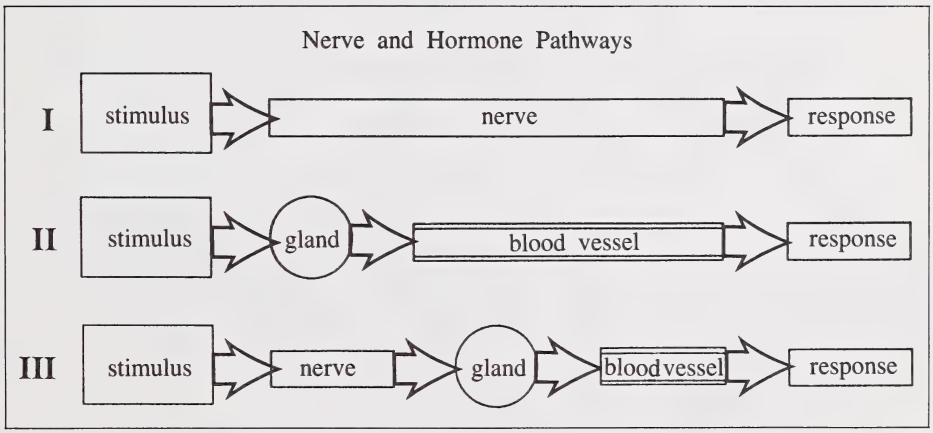
A. Tubule cells of the nephron actively transport calcium from the blood into the filtrate.

B. Decreasing thyroid hormone levels in the blood promote the release of calcium from bone.

C. Increasing parathyroid hormone levels stimulate the release of calcium from bone.

D. Liver cells metabolize the injected agent into its byproducts.

Use the following information to answer question 61.

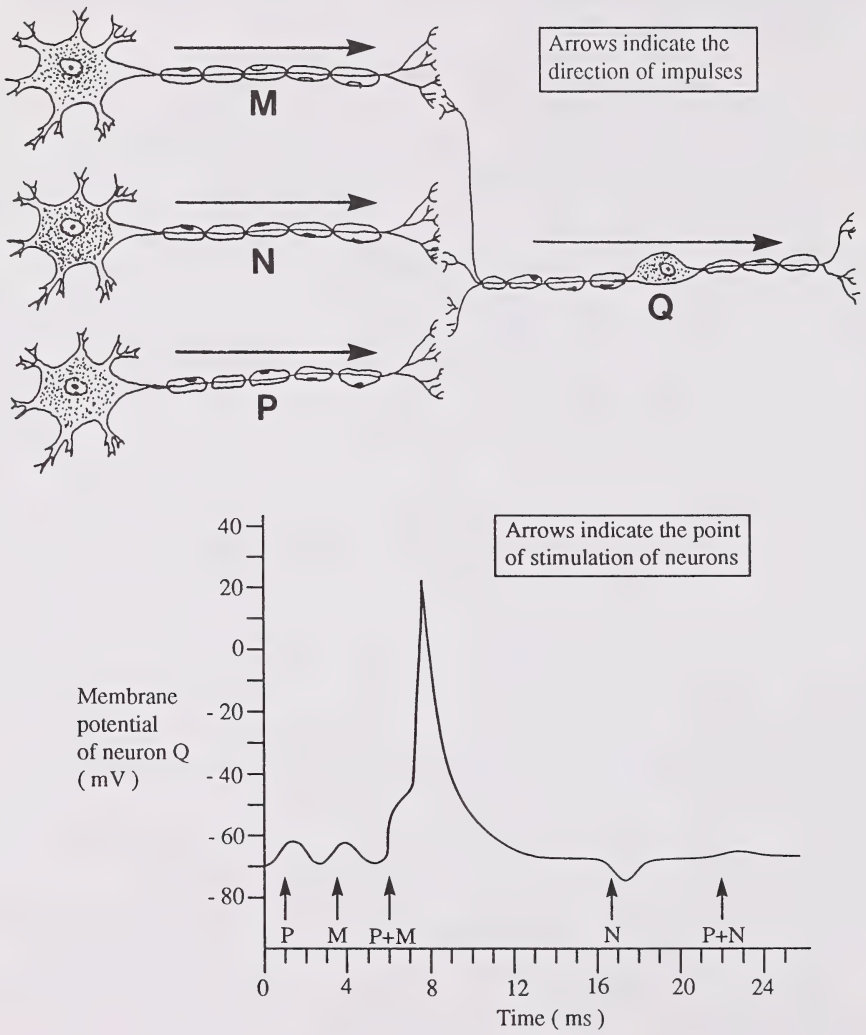


61. Which series of nerve and hormone pathways is correctly matched with the responses given below?

Series	Responses		
	Response of Target Cells to Adrenaline	Response of Target Cells to Insulin	Contraction of Skeletal Muscle
A	I	III	I
B	II	I	I
C	III	II	III
D	III	II	I

Use the following information to answer question 62.

An experiment was conducted to examine the relationship of neurons M, N, and P to neuron Q. A microelectrode recorded the membrane potential of neuron Q. The graph illustrates the results.



62. Which neuron acts as an inhibitor?

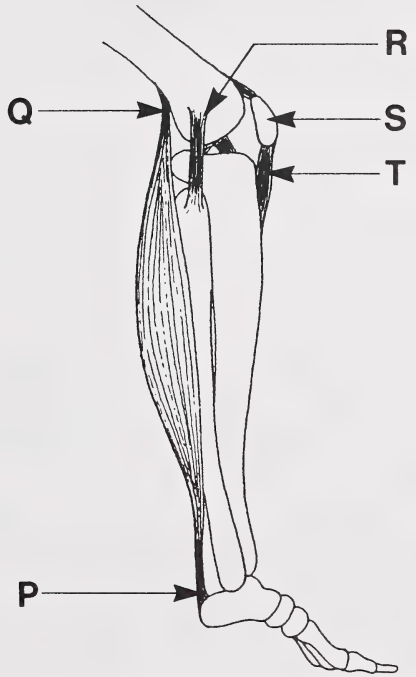
A. M
B. N
C. P
D. Q

63. Which cells would be expected to contain the greatest number of mitochondria?

A. Muscle cells of the heart
B. Erythrocytes of the blood
C. Alveoli cells of the lung
D. Cells of fat deposits under the skin

Use the following diagram to answer question 64.

A Part of the Human Leg



64. Tendons are labelled

A. P and T
B. Q and P
C. Q and R
D. R and T

Use the following information to answer question 65.

Folding Filament Theory

A student hypothesized that muscles contracted according to the "Folding Filament Theory." This theory claims that the actin filaments fold like an accordian, thereby contracting the muscle.

65. The student's hypothesis was incorrect because scientific evidence shows that

A. muscles do not bulge
B. actin filaments do not shorten
C. striations do not come closer together
D. contraction does not involve shortening of muscles

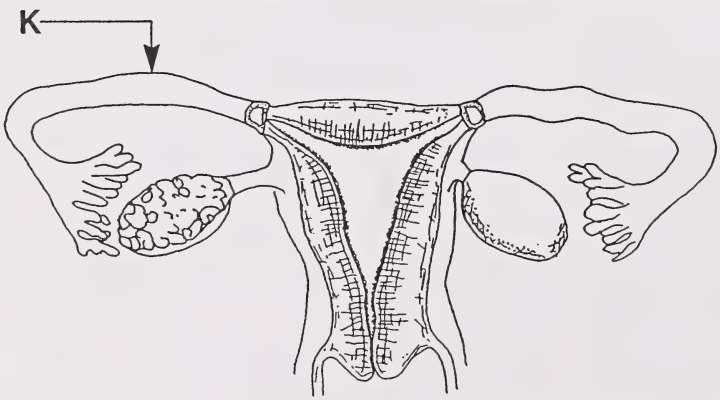
---

66. Fluid from the seminal vesicles nourishes the

A. egg
B. sperm
C. follicle cells
D. interstitial cells

Use the following diagram to answer question 67.

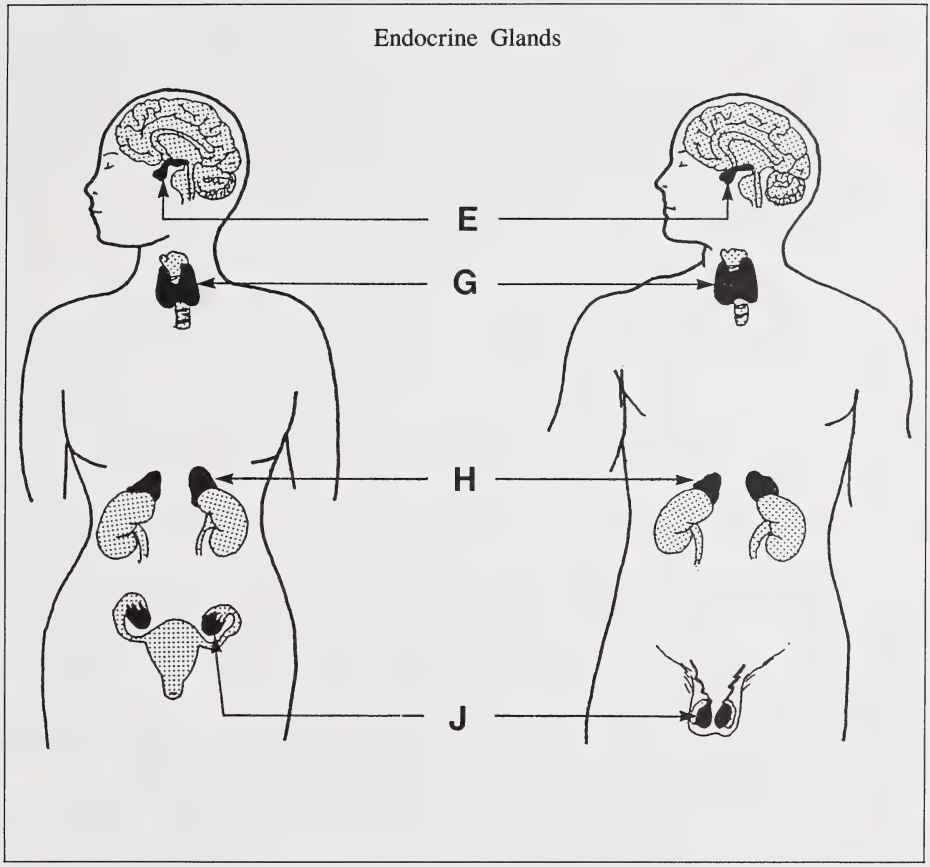
The Female Reproductive System



67. The structure labelled K in the female reproductive system has a similar function to the structure in males called the

A. vas deferens
B. urethra
C. testis
D. ureter

Use the following diagrams to answer question 68.



68. The structures that secrete FSH and the target organs that are affected by this hormone are, respectively,

A. E and G
B. E and J
C. G and H
D. H and J

Use the following information to answer question 69.

Hormone Regulation During Pregnancy

The early stages of pregnancy (first trimester) are primarily maintained by progesterone that is secreted from the __I__. Later stages of pregnancy (third trimester) are maintained by progesterone that is secreted from the __II__.

69. Structures I and II are, respectively,

A. corpus luteum, placenta
B. mature follicle, placenta
C. pituitary gland, corpus luteum
D. pituitary gland, mature follicle

Use the following information to answer question 70.

Random Order of Events in the Experimental Reproduction of Purebred Cattle

I. Each fertilized egg undergoes cell division and the resulting cell mass is subdivided in the laboratory, producing genetically identical embryos.

II. A purebred cow is injected with a superovulation hormone (high concentration of FSH).

III. Eggs are removed from the purebred cow and are artificially inseminated.

IV. Embryos are transplanted into other cows and placental formation occurs.

V. Many follicles begin to mature.

70. An Alberta company that specializes in the breeding of purebred cattle has devised a procedure for producing many genetically identical offspring from one purebred cow. What order of events would likely result in a successful procedure?

A. II, III, V, IV, I
B. II, V, I, III, IV
C. II, V, III, I, IV
D. III, II, V, I, IV

YOU HAVE NOW COMPLETED PART A. PROCEED DIRECTLY TO PART B.

PART B

INSTRUCTIONS

In this part of the examination, there are seven written-response questions for a total of 30 marks.

Read each question carefully. Write your answers in the examination booklet as neatly as possible.

Communicate your answers in clear, complete sentences unless the response format dictates otherwise. Marks will be awarded for pertinent explanations and answers. Question 3 has two marks allotted for written communication skills.

NOTE: The perforated pages at the back of this booklet may be torn out and used for your rough work. **No marks** will be given for work done on the tear-out pages.

START PART B IMMEDIATELY.

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(4 marks)

1. Anabolic steroids (synthetic male sex hormones) are complex, fat-soluble molecules that easily penetrate the membranes of many cells. Once inside the cell, these steroids tend to increase the synthesis of protein molecules and the retention of many ions such as Na^+, K^+, and Ca^{2+}. One adverse physiological effect of using these hormones is increased water retention in the body tissues.

   a. Explain why these fat-soluble anabolic steroids are able to penetrate cell membranes easily.

   b. Explain why anabolic steroids cause increased water retention in body tissues.

   c. Describe **one adverse** physiological effect, other than water retention, that the use of anabolic steroids has on

   i. males

   ii. females

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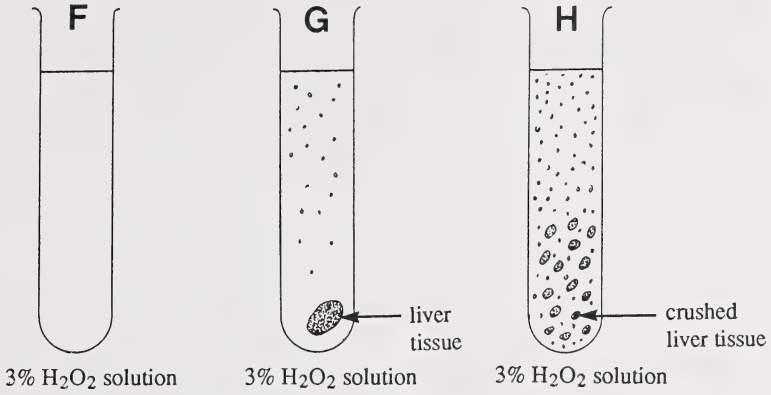
(4 marks)

Use the following information to answer question 2.

Catalase, an enzyme, is produced by living tissues to promote the breakdown of hydrogen peroxide (H_2O_2) to water and oxygen. In this experiment, the production of bubbles in the test tubes indicates the presence of catalase.



Results: F – no reaction
G – moderate reaction
H – violent reaction

2. a. Which test tube is the control for this experiment?

Test tube _____

b. Why is the reaction in test tube H more vigorous than the reaction in test tube G?

_____

_____

c. After the reaction in test tube H subsides, the crushed liver tissue is removed and added to a fresh 3% H_2O_2 solution in another test tube. What is the rate of reaction in that test tube? Explain your answer.

_____

_____

_____

_____

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(6 marks)

3. Because of a serious illness, a patient is required to have two-thirds of his stomach surgically removed. The surgical procedure will restore the continuous digestive tract. Identify and explain **four** major effects this surgery will have on the digestive processes of the patient.

(**Four** marks will be allotted for concepts and **two** marks for evidence of logical thought expressed with appropriate vocabulary.)

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Use the following table to answer question 4.

Blood Sample	Relative Concentrations of Substances Found in a Venule			
	Glucose	Oxygen	Lactic Acid	Carbon Dioxide
I	low	low	low	high
II	high	low	low	high
III	low	low	high	high
IV	high	high	high	low

4. **a.** Which sample likely comes from blood leaving a fatigued muscle? **(4 marks)**

Blood Sample _____

b. Justify your choice of blood sample by explaining the relative concentrations of glucose, lactic acid, and carbon dioxide.

Glucose _____

_____

_____

_____

Lactic acid _____

_____

_____

_____

Carbon dioxide _____

_____

_____

_____

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Use the following information to answer question 5.

A Biology 30 student went with friends to a rock concert that featured flashing lights, a high level of sound, a vivid stage presentation, and vigorous dancing by the audience.

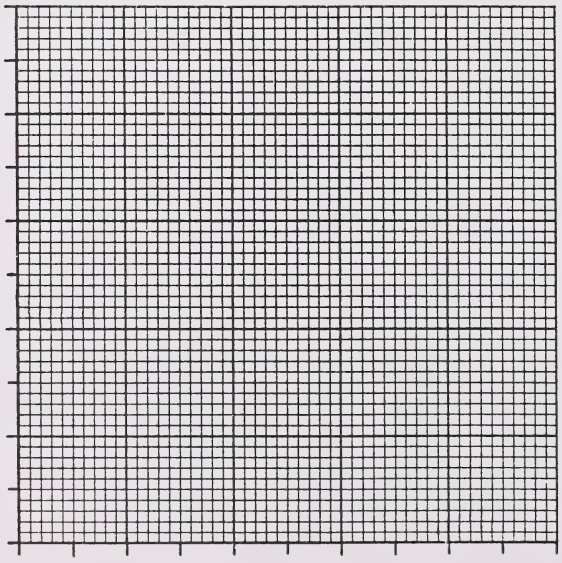
At 10-minute intervals during the concert, the student's heart rate and breathing rate were measured:

	Time (min)	Heart Rate (beats/min)
Start of Concert	0	64
	10	72
	20	76
	30	84
	40	88
	50	92
	60	92
	70	90
	80	84
End of Concert	90	70

	Time (min)	Breathing Rate (breaths/min)
Start of Concert	0	16
	10	18
	20	22
	30	24
	40	26
	50	26
	60	28
	70	22
	80	17
End of Concert	90	16

(6 marks)

5. a. Construct a graph, plotting heart rates and breathing rates on the same set of axes. Use the horizontal axis for the manipulated (independent) variable, a solid line for the heart rate, and a broken line for the breathing rate. Label the graph.



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b. Which region of the brain initiated the autonomic nerve impulses that brought about the changes in the heart and breathing rates of the student?

Brain region _____

c. Describe two mechanisms, one nervous and one hormonal, that brought about the increase in the heart rate of the student.

i. Nervous mechanism _____

_____

_____

_____

_____

ii. Hormonal mechanism _____

_____

_____

_____

_____

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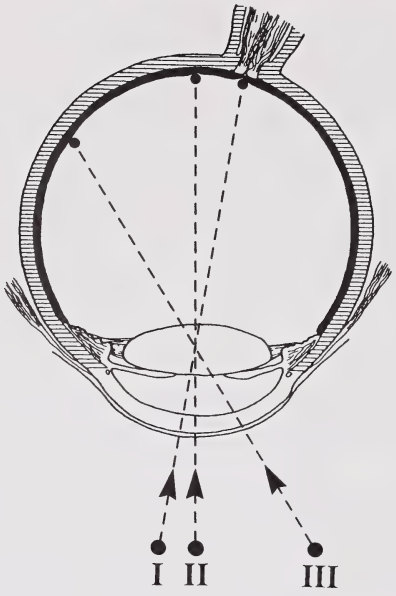
Use the following diagram to answer question 6.

Perception of a Blue Object Placed in Three Different Positions

Position	Perception
I	No object is seen
II	The object is seen and appears blue
III	The object is seen and appears grey



(3 marks)

6. Explain each perception.

Position I: _____

_____

_____

_____

Position II: _____

_____

_____

_____

Position III: _____

_____

_____

_____

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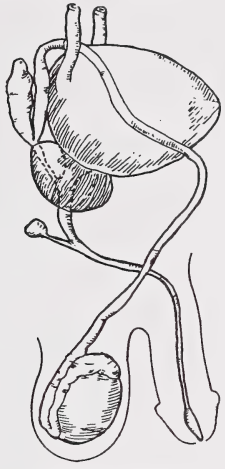
Use the following diagram to answer question 7.

The Male Reproductive System



7. a. Enlargement of the prostate gland is a common problem experienced by older human males. How does the enlargement of this gland affect excretion? **(3 marks)**

_____

_____

_____

_____

b. Suppose treatment for an enlarged prostate is limited to the surgical removal of a portion of the gland. Predict how this treatment would affect the quantity and quality of semen produced.

_____

_____

_____

_____

_____

_____

YOU HAVE NOW COMPLETED THE EXAMINATION. IF YOU HAVE TIME, YOU MAY WISH TO GO BACK AND CHECK YOUR ANSWERS.

TEAR-OUT PAGE

(NO MARKS WILL BE GIVEN FOR WORK DONE ON THIS PAGE)

FOLD AND TEAR ALONG PERFORATION

TEAR-OUT PAGE

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FOLD AND TEAR ALONG PERFORATION

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M1 M2 M3 M4

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